

Roberts. (M.J.)

THE EXPLORATION, EXCAVATION, AND ILLUMINATION OF
THE INTERIOR OF BONES IN ANY PART
OF THE BODY.*

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I wish to make a preliminary communication to this society upon a subject to which I have been giving some thought during a period of about a year and a half or two years. Not only have I been giving some thought to the subject, but have actually spent considerable time in the elaboration of instruments for executing the work in question. I refer to the exploration, excavation, and illumination of the interior of bones in any part of the body.

The object of the operative procedure which I contemplate, stated in general terms, is the speedy cure or termination of morbid processes which, when left to take their course, tend to long continuance and are usually followed by a train of disastrous sequences. I refer more particularly to caries of the ends of long bones entering into the formation of joints, whether the morbid process be tubercular or not. We find abundant support in favor of pathological experimentation and clinical research in the direction indicated.

First. Most of our pathological observations on the bone diseases of joints go to support the general idea that the morbid process, as a rule, primarily attacks the central or cancellous portions of the ends of bone rather than the compact tissue on the surface; and furthermore, that the area of bone affected, in the early clinical history of these ailments, is not only well defined but of limited extent.†

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†Attention was called to this fact in a paper which I read before the Medical Society of the State of New York, February 6th, 1884, entitled "The Fundamental Principles of Mechanico-Therapy in Hip Disease; based on a Consideration of Clinical, Pathological, and Physico-Physiological Data, with a description of New Forms of Elastic Tension Hip Splints."



Second. That, "whenever artificial or pathological irritation causes an exuberant development of embryonic elements, and the irritation be removed, the new embryonic tissue tends to return to the primitive form of the tissue which served as a matrix."*

Third "For new osseous tissue to be rapidly developed on the surface of a denuded bone it is not necessary that it should be covered with periosteum." . . . "It is not only, moreover, on the surface of inflamed bones that osseous tissue is produced; in fact, when inflammation ceases, the anfractuous cavities which have been hollowed in the bone are soon filled up by new osseous layers, which are developed in exactly the same way as on the surface of the bone."†

The benefit which it is believed will accrue to suffering humanity from a thorough elaboration of these ideas will be to place such information in the hands of the surgeon as will enable him to make,

First, An early positive diagnosis of the existence of disease in the bone;

Second, To determine its site and probable extent;

Third, To remove by operative procedures the diseased area of tissue;

Fourth, By properly conducting the after treatment, to secure the filling up of this cavity with new and healthy osseous tissue.

Much study and careful thought, to say nothing of the expense of conducting experiments and elaborating instruments and apparatus will be required to realize fully what, it is believed, will ultimately accrue to medical science.

In order to successfully conduct an operation of the interior of the head of any of the bones entering into the formation of the larger articulations, it will be necessary that the surgeon possess an intimate knowledge of intra-epiphyseal topographical anatomy; that is to say, it will be necessary for him, in conducting these excavations, to be able to estimate very closely the distance from any point in the interior of the bone, to its surface in any direction. Otherwise, the healthy and compact outer layer of bone will be unnecessarily perforated.

I may be permitted to briefly state what I have already done in the way of promoting the proposed line of research.

First of all, it was evident to me that we must be provided with some means which would enable us to cut bone with greater facility and accuracy than could be done with any instrument now in use. To this end I have devoted much thought and time, and have expended a very consid-

* Manual of Pathological Histology by Cornil and Ranvier, translated by A. M. Hart, Vol. I., p. 116. London, 1882.

† Loc. cito., p. 331.

erable amount of money. My aim has been to make as nearly a universal osteotome as possible; that is, an instrument with which the surgeon can cut bone with ease, safety, and accuracy in any desired direction. The instrument which I have elaborated is called the electro-osteotome. Public attention was first directed to it in the issue of the *Medical Record* for October 27th, 1883. Since that time I have improved the instrument very materially. A full description of these improvements was given and a practical demonstration of the working of the instrument was made before the New York Academy of Medicine, the 19th of February, 1885. I cannot here again give a full description of the instrument, but will simply say that, as it is now constructed, it is provided with two head-pieces, one for the carrying of various sizes of circular saws, and the other for the holding of drills and burrs of various shapes and sizes. By means of this instrument a bone may be perforated with any size drill up to a quarter of an inch in diameter, or a cross or longitudinal section of it made with as much facility as a similar wound could be made in the soft parts by means of a sharp scalpel.

As to the use of this instrument for the work in hand:

First. For the early positive diagnosis of the existence of diseased bone. For this purpose the instrument is provided with very fine drills from the one-sixteenth to the one thirty-second of an inch in diameter. These drills are constructed, not after the form of the ordinary twist drill, but upon the principle of a cheese-tester; that is, they have a longitudinal groove on one side. By means of such a drill a plug or sample can be removed from any suspected area of bone. No incision through the soft parts is necessary. The drills revolve at a very high rate of speed, and readily penetrate the soft parts and bone. Upon removal of the drill, the debris lodged in the groove is placed upon a glass slide and examined under the microscope. If there be commencing osteitis, the characteristic findings will be manifest. Of course, when drilling into the head of a bone, and a cavity or soft spot is reached, the sensation communicated to the hand will be all that is desired to establish the fact. The use of the drill in this manner is analogous to the use of the hypodermic needle in the soft parts for diagnostic purposes. If no disease exists, no harm is done by means of the puncture.

Once having thus positively determined the existence, site and probable extent of disease, an incision is made down to the bone, and a large drill or trephine, from a quarter of an inch to a half inch in diameter, is carried through the bone into the diseased area or cavity. Upon removing this, smaller drills or burrs may be passed in through the opening thus made, and used to excavate the affected bone.

For the thorough inspection of the parts, I have had constructed a miniature incandescent lamp, so small as to readily pass through a quar-

ter inch drill hole. These lamps, (half-candle) furnish sufficient light to thoroughly illuminate the interior of any bone cavity.

In operating upon the living subject there may be more or less bleeding. The hæmorrhage, however, may be controlled by the use of rhigolene spray.

Regarding the dangers of systemic poisoning from local operations on bones, I have thought that continuous irrigation with a disinfecting solution, for a period of two or three days following operations, would be an excellent preventive. The danger from septic poisoning in all operations upon bones is confined principally to the period immediately following the operation, when the lymph spaces are exposed to the discharges. After the active inflammatory stage has passed and a granulating surface is established, the danger of septic poisoning from this cause is no longer to be apprehended.

For the purpose of continuous irrigation of an intraosseous cavity, I have thought of using short silver or aluminium tubes, of a size which will fit closely into the opening leading to the excavated area of bone. Into this a cork, provided with two holes and two glass rods, is introduced. Through one of these glass rods the disinfecting solution is conveyed into the cavity, and out of the other it finds its way into the external world. After the period of danger from septic poisoning is past, the continuous irrigation may be dispensed with and the wound washed out as occasion requires.

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